Sentiment Analysis

A Probabilistic Approach

S. A. Gieske S. Laan D. S. Ten Velthuis
C. R. Verschoor A. J. Wiggers

Faculty of Science (FNWI)
University of Amsterdam

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Outline

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The goal of the project

Project Description

Performing sentiment analysis on messages about the EO

- Classification Sentiment vs. Non Sentiment
- Classification Positive vs. Negative

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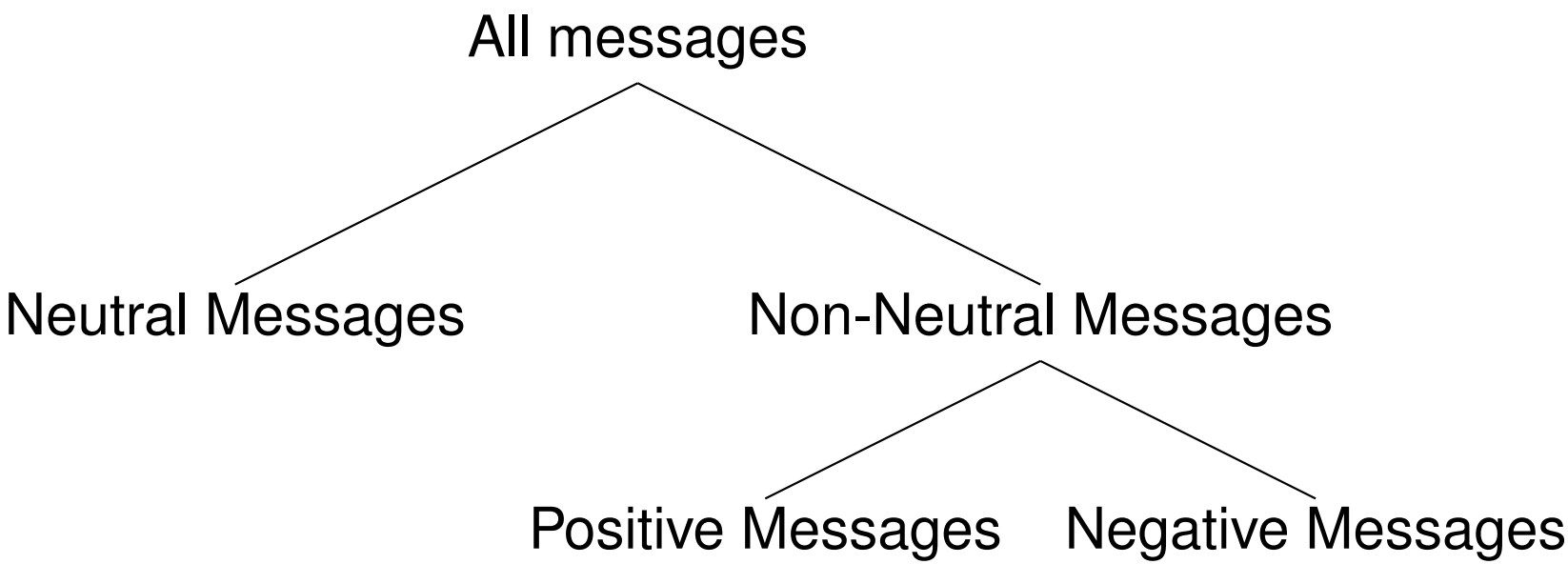
Approach

- Preprocessing of the data
- Perform machine learning algorithms on data
- Use best algorithms to classify real time on server

Hierarchical Classification



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Dataset Analysis

Dataset messages EO

10.000 messages, 19 features per message

Ony 3 features used:

- Source
- Sentiment
- Message contents

Data Cleaning

- Shorten words, ex. hahaha to haha
- Stemmer

Data Reduction

- Only use Twitter messages (83% of all messages)
- Remove articles, reference words and prepositions
- Substitute smileys with words
- Remove some punctuation marks (ex. not ! ?)

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Classification

Weighted Sum Probability

- Create tokens
- Assign sentiment probabilities to tokens

$$P(word) = \frac{\sum word \in C_1}{\sum word \in C_1 \cup C_2} \tag{1}$$

- Assign sentiment probabilities to sentences

$$P(s) = \frac{1}{n} \sum_{w \in s} P(w) \tag{2}$$

Perceptron

Algorithm

Train linear treshold

Input : Sentence probabilities, sentence values

Output : Treshold

Results & Conclusion

Results : High precision OR recall, never both

Conclusion : Linear threshold not good enough

Support Vector Machine

Algorithm

Fit in featurespace that binds features to classes

Input : Features in vector

Output : Number belonging to class

Results & Conclusion

Results : Not very good recall/precision/accuracy

Conclusion : Fit can not be made on these features
or more data needed to find clear boundary

Naive Bayes

Algorithm

Input :

Output :

Results & Conclusion

Results :

Conclusion :

Multiclassification with Perceptron

Algorithm

Input :

Output :

Results & Conclusion

Results :

Conclusion :

Entropy

Entropy

Algorithm

Input :

Output :

Results & Conclusion

Results :

Conclusion :

Neural Network

Algorithm

Backpropagation

Input : Word vectors

Output : Value for

Results & Conclusion

Results : Training time = 2.85377444 hours.

Test \Real	True	False
True	14	6
False	40	94

Conclusion : Still many messages with sentiment incorrectly classified.
Possible cause: ratio of messages with sentiment and nonsentiment.

Outline

Webserver Framework

Request (HTML) → Server (PHP/PYTHON) → Result (XML)

Request http://url.com/?**dataset**=1&**message**=De EO is cool!

Result XML File (Containing: Status, Message, Sentiment, Accuracy, Precision, Recall)

Demo

Action...

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Conclusion

- All learning algorithms have their (dis)advantages
- No satisfying results
- Not enough data

Questions?